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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/689,409	10/20/2003	Ronald A. Ferrante	02CR239/KE	2553

7590 06/04/2007  
Rockwell Collins, Inc.  
Attention: Kyle Epele  
M/S 124-323  
400 Collins Rd. NE  
Cedar Rapids, IA 52498

EXAMINER
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CHU, RANDOLPH I

ART UNIT	PAPER NUMBER
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2624

MAIL DATE	DELIVERY MODE
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06/04/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/689,409	<b>Applicant(s)</b> FERRANTE ET AL.	
	<b>Examiner</b> Randolph Chu	<b>Art Unit</b> 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 12 March 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Arguments***

1. In response to applicant's amendment received on 3/12/2007, requested changes to the claim have been entered.

### ***Response to Arguments***

2. Applicant's arguments with respect to claims 1, 7 and 13 have been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 7, 13, and 20-22 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent 5,526,446 to Adelson et al.

With respect to claim 1, Adelson et al. teaches,  
receiving a reference digital image (Fig. 1A, ref no. 10);

receiving a degraded version of the reference digital image (Fig. 1A, ref no. 12);  
deconvolving the reference digital image with the degraded version of the  
reference digital image to form an enhancement function (Fig. 1A, ref no. 26 and 28);  
storing a plurality of the enhancement functions to a storage device (Fig. 1A, ref  
no. 26 and 28, LUT (Look Up table) means it has a plurality of the functions);  
indexing (coefficient) each of the plurality of enhancement functions according to  
the degree of degradation (coefficient) of the degraded version of the reference digital  
image utilized to form the enhancement function (Fig. 1A; col. 6, lines 39-67)  
receiving the new digital image (Fig. 1D, ref. no. 30);  
determining the degree of degradation of the new digital image (Fig. 1D, ref. no.  
34);  
selecting a stored enhancement function having an index (coefficient)  
corresponding to a degree of degradation (coefficient) that of the new digital image (Fig.  
1D, ref. no. 36);  
applying the stored enhancement function to the new digital image to form an  
enhanced digital image (Fig. 1D, ref. no. 36 and 38); and  
making available the enhanced digital image (Fig. 1D, Enhanced Image).

With respect to claim 7, please refer to rejection With respect to claim 1

With respect to claim 13, please refer to rejection With respect to claim 1

With respect to claim 20, Adelson et al. teaches that the degree of degradation (coefficient) is a measure of visual range (visual appearance) (col. 6, lines 39-67).

With respect to claim 21, please refer to rejection With respect to claim 20.

With respect to claim 22, please refer to rejection With respect to claim 20.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1,2, 5-8, 11, 13, 14, 17 and 19 are rejected under 35 USC 103(a) as being unpatentable over George (US Patent 6,459,818) in view of Adelson et al. (US Patent 5,526,446).

With respect to claim 1, George teaches, a method of enhancing the quality of a new digital image comprising:

receiving a reference digital image (Fig. 8, Stored Reference Image; Fig. 3A; col. 4 lines 36-40);

receiving a degraded version of the reference digital image (Fig. 8, Degraded Reference Image; Fig. 5A)

deconvolving the reference digital image with the degraded version of the reference digital image to form an enhancement function (Fig. 8, Ref Label 56; col. 5 line 18 – col. 6 line 9);

receiving the new digital image (Fig. 8, Degraded Unknown Image);

making available the enhanced digital image (Fig. 1A, Ref Label 22);

George does not teach expressly that storing a plurality of the enhancement functions to a storage device;

indexing each of the plurality of enhancement functions according to the degree of degradation of the degraded version of the reference digital image utilized to form the enhancement function;

determining the degree of degradation of the new digital image;

selecting a stored enhancement function having an index corresponding to a degree of degradation that of the new digital image;

applying the stored enhancement function to the new digital image to form an enhanced digital image;

Adelson et al. teaches storing a plurality of the enhancement functions to a storage device (Fig. 1A, ref no. 26 and 28, LUT (Look Up table) means it has a plurality of the functions);

indexing (coefficient) each of the plurality of enhancement functions according to the degree of degradation (coefficient) of the degraded version of the reference digital image utilized to form the enhancement function (Fig. 1A; col. 6, lines 39-67)

determining the degree of degradation of the new digital image (Fig. 1D, ref. no. 34);

selecting a stored enhancement function having an index (coefficient) corresponding to a degree of degradation (coefficient) that of the new digital image (Fig. 1D, ref. no. 36);

applying the stored enhancement function to the new digital image to form an enhanced digital image (Fig. 1D, ref. no. 36 and 38); and

At the time of the invention it would have been obvious to a person of ordinary skill in the art to store indexed enhancement function based on degree of degradation and enhance the input images in the method and apparatus of George.

The suggestion/motivation for doing so would have been using predefined enhancement functions so that process of enhancement can be quicker.

Therefore, it would have been obvious to combine Adelson et al. with George to obtain the invention as specified in claim 1.

With respect to claim 2, George teaches, deconvolving the reference digital image with the degraded version of the reference digital image comprises:

computing a two-dimensional transform of the reference digital image (Fig. 8, Ref Label 54);

computing a two-dimensional transform of the degraded version of the reference digital image (Fig. 8, Ref Label 50);

dividing the two-dimensional transform of the reference digital image by the two-

dimensional transform of the degraded version of the reference digital image to form a two-dimensional quotient (Fig. 8, Ref Label 56), and

computing a two-dimensional inverse transform of the two-dimensional quotient (Fig. 8, Ref Label 58).

With respect to claim 5, George teaches, receiving the new digital image comprises transferring the new digital image from a digital camera (col. 4 lines 36-40).

With respect to claim 6, George teaches, applying an enhancement function comprises:

representing the enhancement function as a digital filter (col. 5 line 46 – col. 6 line 9);

applying the new digital image to the input of the digital filter; and

computing the output of the digital filter (Fig. 8 ref label 56).

With respect to claim 7 please refer to 103 rejection for claim 1.

With respect to claim 8, George teaches, the deconvolution unit comprises:

two-dimensional transform computing unit capable of computing a two-dimensional transform (Fig. 8, Ref Label 50, 52 and 54); and

two-dimensional complex arithmetic unit capable of dividing a first two-dimensional transform by a second two-dimensional transform (Fig. 8, Ref Label 56);.



With respect to claim 11, George teaches, the image receiving unit comprises an interface to a digital camera (col. 4 lines 36-40).

With respect to claim 13 please refer to 103 rejection for claim 1.

With respect to claim 14, George teaches, the memory (Fig. 1A, ref. Label 24) further has stored therein a two-dimensional transform instruction sequence that, when executed by the processor, minimally causes the processor to perform a two-dimensional transform and wherein the processor comprises an arithmetic unit capable of dividing a first two-dimensional transform by a second two-dimensional transform (Fig. 8).

With respect to claim 17, George teaches, the image receiver comprises a digital camera interface capable of receiving a digital image transferred from a digital camera (Fig. 1A, ref. Label 12; col. 4 lines 36-40).

With respect to claim 19, George teaches, the image processing instruction sequences further comprise:

two-dimensional transform instruction sequence that, when executed by the processor, minimally causes the processor to perform a two-dimensional transform and

wherein the processor comprises an arithmetic unit capable of computing the product of a first two-dimensional transform and a second two-dimensional transform (Fig. 8).

7. Claims 3, 9 and 15 are rejected under 35 USC 103(a) as being unpatentable over George (US Patent 6,459,818) in view of Adelson et al. (US Patent 5,526,446) and in further view of Tsujita (US Patent 5,879,284).

George and Adelson et al. teach all the limitations of claims 1, 7 and 13 as applied above from which claims 3, 9, and 15 respectively depend.

George and Adelson et al. do not disclose expressly that computing a least-squares deconvolution of images.

Tsujita teaches a least square filter (wiener filter reverse convolution filter) (col. 3, lines 29-34).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a least-squares deconvolution filter in the method and apparatus of George and Adelson et al.

The suggestion/motivation for doing so would have been to minimize the mean square error between original image and restored image. (Tsujita, col. 3, lines 29-34)

Therefore, it would have been obvious to combine Tsujita with George and Adelson et al. to obtain the invention as specified in claims 3, 9 and 15.

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8. Claims 4, 10 and 16 are rejected under 35 USC 103(a) as being unpatentable over George (US Patent 6,459,818) in view of Adelson et al. (US Patent 5,526,446) and in further view of Acharya (US Patent 6,108,453)

George and Adelson et al. teach all the limitations of claims 1, 7 and 13 as applied above from which claims 4, 10, and 16 respectively depend.

George and Adelson et al. do not disclose expressly that combining the first and second degraded versions of the reference digital image to form an average degraded version of the reference digital image.

Acharya teaches average on the input image (col. 2, lines 13-28).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to average the input images in the method and apparatus of George and Adelson et al.

The suggestion/motivation for doing so would have been to generate a smother (less jogged) version of the input image (Acharya, col. 2, lines 13-28). Therefore, it would have been obvious to combine Acharya with George and Adelson et al. to obtain the invention as specified in claims 4, 10 and 16.

9. Claims 12 and 18 are rejected under 35 USC 103(a) as being unpatentable over George (US Patent 6,459,818) in view of Adelson et al. (US Patent 5,526,446) and in further view of Ishihara et al. (US Patent 5,390,264).

George and Adelson et al. teach all the limitations of claims 2 and 18 except, unit-sample response coefficient table. George teaches digital filter unit-sample response coefficient that represents the enhancement function, but not in table.

Ishihara et al. teaches enhancement coefficient table memory sing a function (col. 4 lines 10-23).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use unit-sample response coefficient table when enhancing the images in the method and apparatus of George and Adelson et al.

The suggestion/motivation for doing so would have been that digital filter unit-sample response coefficient that represents the enhancement function is prepared and stored in table so that enhancement procedure can be quicker (Ishihara et al., col. 4 lines 39-51).

Therefore, it would have been obvious to combine Ishihara et al. with George and Adelson et al. to obtain the invention as specified in claims 12 and 18.

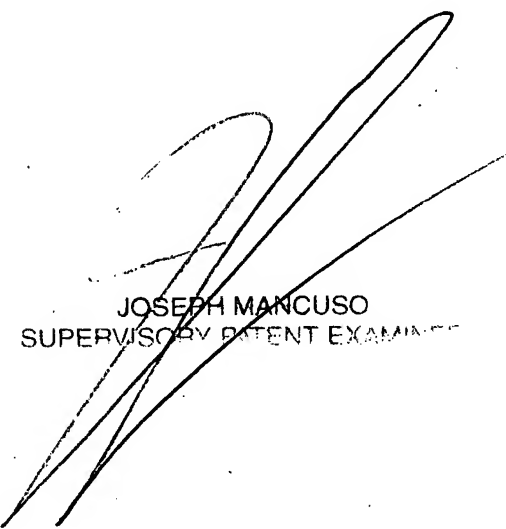
### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randolph Chu whose telephone number is 571-270-1145. The examiner can normally be reached on Monday to Thursday from 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on 571-272-7695/7695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RIC/



JOSEPH MANCUSO  
SUPERVISORY PATENT EXAMINER